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UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Ilias Manettas et al.
Application Number:	10/551,339
Filing Date:	09/14/2006
Group Art Unit:	3744
Examiner:	Alexis K. Cox
Title:	REFRIGERATION DEVICE WITH ADAPTIVE AUTOMATIC DEFROSTING AND CORRESPONDING DEFROSTING METHOD

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APPEAL BRIEF

Pursuant to 37 CFR 1.192, Appellants hereby file an appeal brief in the above-identified application. This Appeal Brief is accompanied by the requisite fee set forth in 37 CFR 1.17(f).

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(1) REAL PARTY IN INTEREST

The real party in interest is BSH Bosch und Siemens Hausgeräte GmbH.

(2) RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) STATUS OF CLAIMS

Claims 11-24 are present in this application. Claims 1-10 have been canceled. Claims 11-24 have been rejected and are on appeal.

(4) STATUS OF AMENDMENTS

No Amendments have been filed since the March 15, 2010 final Office Action.

(5) SUMMARY OF CLAIMED SUBJECT MATTER

The invention relates to a refrigeration device including an automatically defrostable evaporator and a defrosting method therefor. In so-called no-frost refrigeration devices, an evaporator which serves to cool an inner chamber of a thermally insulating housing which can be filled with chilled goods, is accommodated in a chamber separate from the inner chamber, communicating with the inner chamber by means of air passage openings. Together with the air passage openings, this chamber forms an air passage through which air is circulated in order to be cooled on the evaporator and returned to the inner chamber. See page 1, lines 4-15.

Fig. 1 is a schematic diagram showing a no-frost refrigeration device. The device includes a thermally insulating housing 1 in which is formed an inner chamber 2 for receiving chilled goods and an evaporator chamber 5 separated from the inner chamber 2 by an intermediate wall 3 and communicating with the inner chamber 2 through openings in the intermediate wall 3. Located in the evaporator chamber 5 is a plate-shaped evaporator 7

supplied with coolant by a refrigerating machine 6 and in close contact therewith, a defrosting heater 8. See page 5, line 29 - page 6, line 5.

The evaporator chamber 5 and the openings 4 are jointly designated as an air passage. A control circuit 10 controls the operation of the refrigerating machine 6 and a fan 11 attached to the upper opening 4 by means of a measured signal from a temperature sensor in the inner chamber 2. In a first embodiment, a wind wheel 12 is located in the lower opening 4 which is driven to turn by the air flow caused by the fan. Its rotation is recorded by an incremental encoder 13 connected to the control circuit 10. Using the signals of the incremental encoder 13, the control circuit is able to assess the turning speed of the wind wheel 12 and thus the air flow through the air passage. If the turning speed falls below a predetermined threshold value, this is an indication that the free cross-section of the evaporator chamber 5 is significantly reduced by ice formation on the evaporator 7 and that a defrosting process is required. See page 6, lines 7-32.

For defrosting, the control circuit 10 applies a heating current to the defrosting heater 8 via a switch 9 for a predetermined time interval. See page 6, line 34 - page 7, line 1.

Fig. 2 shows a section from the air passage, e.g., at the height of one of the openings 4, according to a second embodiment. Anchored in the wall of the passage is a flexible lamella 14 that projects into the passage and is deflected by an air flow from a rest position shown by the dashed lines into an elastically bent position shown by the continuous lines. This position of the lamella 14 is recorded by a proximity sensor 15 arranged in the passage. See page 7, lines 25-33.

Fig. 3 shows a section of the air passage according to a third embodiment. The air passage is locally constricted to form a nozzle 17 on the outflow slide of which a chamber 19 is formed with a pressure sensor 18 located therein. The high speed of the air flow on the outlet side of the nozzle 17 causes a severe reduction in pressure in the chamber 19 in the fashion of an ejector pump, which can be recorded using the pressure sensor 18. The control circuit connected to the pressure sensor 18 is thus able to estimate the flow velocity of the air and thus the throughput through the air passage and trigger a defrosting process if the air flow

reaches a critical low value. See page 8, lines 4-16.

In the fourth embodiment, as shown in Fig. 4, two wires 20, 21 with a temperature-dependent resistance value are arranged in the air passage. A measuring circuit 22 or 23 is associated with each wire 20, 21. The measuring circuit applies a low measuring voltage to the wire 20, measures the current flow through the wire 20 resulting therefrom and determines the corresponding resistance or temperature value of the wire 20. The temperature of the wire 21 is recorded by the measuring circuit 23 in the same way as the measuring circuit 22 by means of the resistance of the wire. The value of the heat output required for this purpose is fed by the measuring circuit 23 back to the control circuit 10. If the heat output is higher, it is determined that a larger air flow is present through the air passage. If it falls below a predetermined threshold value, the control circuit 10 recognizes that a critical quantity of ice is reached and triggers a defrosting process. See page 8, line 18 - page 9, line 9.

A fifth embodiment is shown in Fig. 5. A temperature sensor 24 or 25 is attached respectively in the upper opening forming the output of the air passage and on the plate of the evaporator 7. A hatched area designates an ice layer 26 that can form around the evaporator and the defrosting heater 8. If the evaporator 7 is ice-free, the free passage cross-section of the evaporator chamber 5 is relatively large, and an air flow required for effective cooling of the inner chamber 2 can be achieved at low flow velocity and a corresponding long dwell time of the air in contact with the evaporator 7. The cooling of the air on the evaporator 7 is thus intensive, and the difference between the temperatures recorded by the sensors 24, 25 is small. As the thickness of the ice layer 26 on the evaporator 7 increases, the free cross-section of the evaporator chamber 5 decreases, and the air flow consequently decreases so that the flow velocity in the evaporator chamber 5 increases. Consequently, the time available for cooling the air is shortened, and the difference between the temperatures recorded by the sensors 24, 25 increases. If the temperature difference exceeds a predetermined threshold value, the control circuit 10 connected to the sensors 24, 25 triggers a defrosting process. See page 9, line 11 - page 10, line 13.

Specific Support for Independent Claims

Claim 11 defines a refrigeration device including a thermally insulated housing enclosing an inner chamber and an air passage separate from and communicating with the inner chamber. [p. 5, line 29 - p. 6, line 8] An evaporator is arranged in the air passage. [p. 6, lines 2-5] A heating device is provided for heating the evaporator, and a control circuit is provided for controlling operation of the heating device. [p. 6, lines 2-12] A measuring device is arranged in the air passage to provide a measured signal representative of air flow through the air passage. [p. 6, lines 22-25; p. 7, lines 27-31; p. 8, lines 4-16; p. 8, lines 18-28; and p. 9, lines 16-21] The control circuit activates the heating device when the air flow falls below a predetermined threshold value. [p. 6, lines 28-32]

Independent claim 20 defines a method for controlling the defrosting of an evaporator in a refrigeration device. The refrigeration device includes a thermally insulating housing enclosing an inner chamber and enclosing an evaporator arranged in an air passage separated from and communicating with the inner chamber. The refrigeration device also includes a heating device for heating the evaporator and a control circuit for controlling the operation of the heating device. [p. 5, line 29 - p. 6, line 12] The method includes the steps of estimating an air flow through the air passage in which the evaporator is arranged [p. 6, lines 25-28], and triggering a defrosting process when the estimated air flow falls below a predetermined threshold value. [p. 6, lines 28-32]

Claim 21 recites a refrigeration device including a thermally insulated housing enclosing an inner chamber and including an air passage separated from and communicating with the inner chamber. [p. 5, line 29 - p. 6, line 8] An evaporator is arranged in the air passage, and a heating device is provided for heating the evaporator. A control circuit controls operation of the heating device. [p. 6, lines 2-12] A measuring device is disposed in the air passage and is directly displaceable by air flow through the air passage. [p. 6, lines 22-25; p. 7, lines 27-31; p. 8, lines 4-16; p. 8, lines 18-28; and p. 9, lines 16-21] The control circuit communicates with the measuring device and activates the heating device when the air flow through the air passage falls below a predetermined threshold value. [p. 6, lines 28-32]

(6) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether claim 22 is unpatentable under 35 U.S.C. §112, second paragraph.

B. Whether claims 11, 15-18 and 20 are unpatentable under 35 U.S.C. §102(b) as being anticipated by Tilmanis (U.S. Patent No. 3,839,878).

C. Whether claims 12 and 21 are unpatentable under 35 U.S.C. §103(a) over Tilmanis in view of Howland (U.S. Patent No. 3,726,104).

D. Whether claims 13, 21 and 23 are unpatentable under 35 U.S.C. §103(a) over Tilmanis in view of Howland and Berrett et al. (U.S. Patent No. 3,716,096).

E. Whether claims 14 and 24 are unpatentable under 35 U.S.C. §103(a) over Tilmanis in view of Pao (U.S. Patent No. 4,736,594).

F. Whether claim 19 is unpatentable under 35 U.S.C. §103(a) over Tilmanis in view of Harbour (U.S. Patent No. 3,248,894).

(7) ARGUMENT

A. *Claim 22 is not unpatentable under 35 U.S.C. §112, second paragraph.*

Claim 22 was rejected under 35 U.S.C. §112, second paragraph. Appellants acknowledge that a "wind wheel" is a device that rotates in response to the presence of wind. Appellants respectfully take issue with the Examiner's interpretation of the term "directly displaceable" as being restricted to "linear displacement in the direction of air movement." Rather, the term should not be interpreted in a manner that is inconsistent with its ordinary use. Since the air flow directly contacts the wind wheel thereby causing the wind wheel to turn, the wind wheel is "directly displaceable" by air flow through the air passage. Appellants thus submit that claim 22 satisfies the requirements of 35 U.S.C. §112, second paragraph. Withdrawal of the rejection is requested.

B. *Claims 11, 15-18 and 20 are not unpatentable under 35 U.S.C. §102(b) as being anticipated by Tilmanis.*

With regard to claims 11, 15-18 and 20, the Office Action maintains that the temperature sensors in Tilmanis constitute "a measuring device arranged in the air passage to

provide a measured signal representative of the air flow through the air passage." Appellants submit, however that this contention is inaccurate.

Tilmanis discloses an automatic defrosting system for refrigerators and the like. The system includes two thermistors 36, 38 that serve as temperature sensors. In this manner, the system senses the temperature of the evaporator coil (via thermistor 36) and the temperature of a storage space of the refrigerator (via thermistor 38) and automatically initiates operation of the defrost apparatus when the difference between the two temperatures exceeds a predetermined value. Tilmanis describes that as frost builds up on the evaporator coil, it exercises a progressively increasing insulating effect, <u>so that eventually the rate of heat inflow to the storage space exceeds the rate at which heat is extracted therefrom by the evaporator</u>. It is clear then from the express teachings in Tilmanis that the Tilmanis structure monitors *temperatures* to determine whether a defrost operation should be initiated. In contrast, claim 11 defines a measuring device arranged in the air passage that provides a measured signal representative of <u>air flow through the air passage</u>. Nowhere does Tilmanis remotely disclose that the thermistors 36, 38 are capable of providing a signal representative of air flow through the air passage. This distinction appears to have been recognized at some point during the Examiner's consideration of this application or during a supervisory review of the Office Action where a comment was added in the margin on page 3 asking "How is air flow being measured in Tilmanis?" As noted, Tilmanis in fact does not perform any such measurement.

In addition, claim 11 recites that the measuring device is <u>arranged in said air passage</u>. The Office Action's contention that the temperature sensors constitute a measuring device "arranged in the air passage" amounts to a mischaracterization of the Tilmanis structure. As shown in the drawings, even assuming the contentions with regard to the temperature sensors are somehow viable, the second thermistor 38 is positioned <u>in the food storage chamber 12</u>. Since anticipation under 35 U.S.C. §102(b) requires each and every feature of the claimed invention to be disclosed in a single prior art reference, and since at least this feature is also lacking in Tilmanis, Appellants submit that for this reason also, the rejection of independent claim 11 is misplaced.

With regard to dependent claims 15-18, Appellants submit that these claims are allowable at least by virtue of their dependency on an allowable independent claim. Additionally, claim 15 recites that the measuring device includes two temperature sensors that are thermally differently closely coupled to at least one of a heat source and a sink and the air in said passage indicative of air flow speed. Claim 16 recites that the heat sink is the evaporator. The thermistors 36, 38 in Tilmanis, in contrast, are respectively disposed in contact with the evaporator and in the storage chamber. Since this subject matter is also lacking in Tilmanis, Appellants submit that these dependent claims are allowable.

Independent claim 20 defines a method for controlling the defrosting of an evaporator in a refrigeration device. The method includes a step of <u>estimating an air flow through said air passage in which said evaporator is arranged</u>. Nowhere does the Tilmanis patent even remotely disclose a step of estimating an air flow through an air passage. Rather, as noted above, Tilmanis discloses the use of thermistors 36, 38 to measure a difference in the temperatures between the evaporator coil and the storage space. The Examiner contends that Tilmanis discloses "a monitoring and control circuit which estimates an air flow through the air passage in which the evaporator is arranged by determining the difference between the temperature values detected by a pair of temperature sensors." This also is a mischaracterization of the Tilmanis patent. As noted, Tilmanis is unconcerned with detecting or estimating air flow through the air passage. Even if the thermistors in Tilmanis are somehow *capable* of performing this physical step, which Appellants do not believe nor concede, Tilmanis lacks even a remote teaching of performing the claimed estimating step. Since at least this step is missing in the Tilmanis patent, Appellants submit that the rejection of independent claim 20 is also misplaced.

Withdrawal of the rejection is requested.

C. *Claims 12 and 21 are not unpatentable under 35 U.S.C. §103(a) over Tilmanis in view of Howland.*

With regard to claim 12, the Examiner recognizes that Tilmanis lacks the claimed measuring device including a body driven to move by the air flow in the passage and a sensor

to record the movement of the body indicative of air flow speed . . . . The Office Action contends, however, that Howland discloses this subject matter. Appellants respectfully disagree. Howland discloses a refrigeration system including an evaporator coil 10. Air to be cooled by the refrigeration system is blown by a blower fan 13 through the evaporator coil 10. A rotatable impeller 15 is positioned in an opening 14 on one side of the evaporator coil 10. The impeller 15 drives a clock timer gear train 16, which after a certain number of rotations by the impeller 15 activates a defrost initiation signal switch 17. Although a speed of the impeller 15 varies based on air flow through the evaporator coil 10, the impeller 15 does not amount to a sensor "to record the movement of said body <u>indicative of air flow speed</u>." To the contrary, as noted, the impeller 15 merely drives a clock timer gear train 16. Moreover, Appellants submit that claim 12 is allowable at least by virtue of its dependency on an allowable independent claim.

Appellants submit that claim 21 is allowable for similar reasons. In addition, with reference to the discussion above concerning claim 11, claim 21 recites that the measuring device is disposed <u>in said air passage</u>. As discussed above, this subject matter is lacking in Tilmanis, and Howland lacks a suitable teaching that would lead those of ordinary skill in the art to modify the Tilmanis structure to meet this feature of the invention.

Withdrawal of the rejection is requested.

D. *Claims 13, 21 and 23 are not unpatentable under 35 U.S.C. §103(a) over Tilmanis in view of Howland and Berrett.*

With regard to the rejection of claims 13 and 21, Appellants submit that claim 13 is allowable at least by virtue of its dependency on an allowable independent claim. That is, the Howland and Berrett patents do not correct the noted deficiencies with regard to Tilmanis. Moreover, claim 13 recites that the measuring device includes an elastic element that can be deflected from a rest position by the air flow in the passage and a sensor to record the deflection of the element indicative of air flow speed . . . . The Berrett patent merely describes a flow sensor 32 that is responsive to air flow through an air duct to close a switch when a predetermined air flow exists. The flow sensor thus serves only to close the switch

(and possibly to open the switch) as a consequence of a fixed air flow. The measuring device defined in claim 13, to the contrary, includes the elastic element and a sensor that records the deflection of the elastic element indicative of air flow speed. The sensor thus determines an air flow speed based on a deflection *amount* of the elastic element. Appellants submit that this structure is distinguishable from the "sail" switch 32 described in Berrett.

Appellants submit that claim 21 is allowable for similar reasons. In addition, with reference to the discussion above concerning claim 11, claim 21 recites that the measuring device is disposed in said air passage. As discussed above, this subject matter is lacking in Tilmanis, and neither Howland nor Berrett provides a suitable teaching that would lead those of ordinary skill in the art to modify the Tilmanis structure to meet this feature of the invention.

With regard to claim 23, Appellants submit that claim 23 is allowable for similar reasons and by virtue of its dependency on an allowable independent claim.

Withdrawal of the rejection is requested.

E. *Claims 14 and 24 are not unpatentable under 35 U.S.C. §103(a) over Tilmanis in view of Pao.*

With regard to claim 14, Appellants submit that this claim is allowable at least by virtue of its dependency on an allowable independent claim. That is, the Pao patent does not correct the deficiencies noted with regard to Tilmanis and claim 11. In addition, the Office Action recognizes that Tilmanis lacks the claimed measuring device including a pressure sensor to measure a dynamic air pressure in the passage indicative of air flow speed. The Office Action contends that Pao discloses the use of a pressure sensor "to determine air flow across the evaporator coil." Appellants respectfully submit that this contention is a mischaracterization of the Pao patent. Pao in fact specifically describes that the defrosting process "is initiated by pressure switch 18 which senses a drop in the pressure across the coil when compared to a reference fan pressure performance curve." See, for example, col. 4, lines 16-27. Contrary to the Examiner's contentions in the Office Action, sensing a drop in pressure falls short of the claimed subject matter wherein a pressure sensor measures a

dynamic air pressure in the passage indicative of air flow speed. Withdrawal of the rejection is requested.

With regard to claim 24, Appellants submit that claim 24 is allowable for similar reasons and by virtue of its dependency on an allowable independent claim.

Withdrawal of the rejection is requested.

F. *Claim 19 is not unpatentable under 35 U.S.C. §103(a) over Tilmanis in view of Harbour.*

Claim 19 recites that one of the temperature sensors in the embodiment utilizing temperature sensors to determine air flow is arranged on an output of the air passage. In this context, the Examiner contends that it would have been obvious to move the second thermistor 38 in Tilmanis to the outlet of the evaporator passage. Appellants submit that the proposed modification is not suggested in Tilmanis. Tilmanis specifically discloses that the second thermistor 38 is arranged within the frozen food storage chamber 12. The placement of the second thermistor is not arbitrary. Tilmanis describes as an object of the invention to periodically sense the temperature of the evaporator coil and the temperature of a storage space of the refrigerator. Tilmanis initiates the operation of the defrost apparatus when the difference between these two temperatures exceeds a predetermined value. The modification proposed in the Office Action thus directly contrasts an express objective of the Tilmanis patent. Additionally, changing a position of the thermistor 38 would require circuit modifications and programming modifications, which are neither disclosed nor suggested in Tilmanis. Appellants thus respectfully submit that the rejection is misplaced. Appellants respectfully submit that that Office Action's conclusion amounts to improper hindsight. That is, it is hindsight to modify the temperature sensors in Tilmanis for detecting temperature differences between the evaporator and the storage space to a measuring device arranged in the air passage for providing a measured signal representative of air flow through the air passage. Moreover, Appellants submit that this dependent claim is allowable at least by virtue of its dependency on an allowable independent claim.

Withdrawal of the rejection is requested.

(8) CONCLUSION

In view of the foregoing discussion, Appellants respectfully request reversal of the Examiner's rejections.

Respectfully submitted,

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CLAIMS APPENDIX

1-10. (Canceled)

11. (Rejected) A refrigeration device, comprising:

a thermally insulating housing;

said thermally insulating housing enclosing an inner chamber;

said thermally insulating housing enclosing an evaporator arranged in an air passage separated from and communicating with said inner chamber;

a heating device for heating said evaporator;

a control circuit for controlling operation of said heating device;

a measuring device arranged in said air passage to provide a measured signal representative of air flow through said air passage; and

said control circuit coupled to said measuring device and receiving said measured signal, said control circuit activating said heating device when the air flow falls below a predetermined threshold value.

12. (Rejected) The refrigeration device according to claim 11, wherein said measuring device includes a body driven to move by said air flow in said passage and a sensor to record the movement of said body indicative of air flow speed and said control circuit determines a fall below said threshold value when the air flow speed falls below said threshold value.

13. (Rejected) The refrigeration device according to claim 11, wherein said measuring device includes an elastic element which can be deflected from a rest position by said air flow in said passage and a sensor to record the deflection of said element indicative of

air flow speed and said control circuit determines a fall below said threshold value when the recorded deflection falls below said threshold value.

14. (Rejected) The refrigeration device according to claim 11, wherein said measuring device includes a pressure sensor to measure a dynamic air pressure in said passage indicative of air flow speed and said control circuit determines a fall below the threshold value when said recorded pressure rises above said threshold value.

15. (Rejected) The refrigeration device according to claim 11, wherein said measuring device includes two temperature sensors which are thermally differently closely coupled to at least one of a heat source and a sink and the air in said passage indicative of air flow speed and said control circuit determines a fall below the threshold value when the difference between the temperatures recorded by the two sensors exceeds said threshold value.

16. (Rejected) The refrigeration device according to claim 15, wherein said heat sink is said evaporator.

17. (Rejected) The refrigeration device according to claim 16, including a first one of said temperature sensors arranged directly in contact with said evaporator.

18. (Rejected) The refrigeration device according to claim 17, wherein said first temperature sensor is arranged on an area of said evaporator which is capable of icing up.

19. (Rejected) The refrigeration device according to claim 18, wherein a second one of said temperature sensors is arranged on an output of said passage.

20. (Rejected) A method for controlling the defrosting of an evaporator in a refrigeration device, said refrigeration device comprising a thermally insulating housing; said

thermally insulating housing enclosing an inner chamber; said thermally insulating housing enclosing an evaporator arranged in an air passage separated from and communicating with said inner chamber; a heating device for heating said evaporator; and a control circuit for controlling the operation of said heating device, said method comprising:

estimating an air flow through said air passage in which said evaporator is arranged; and

triggering a defrosting process when the estimated air flow falls below a predetermined threshold value.

21. (Rejected) A refrigeration device, comprising:

a thermally insulated housing enclosing an inner chamber and including an air passage separated from and communicating with said inner chamber;

an evaporator arranged in said air passage;

a heating device for heating said evaporator;

a control circuit for controlling operation of said heating device; and

a measuring device disposed in said air passage, said measuring device being directly displaceable by air flow through said air passage,

wherein said control circuit communicates with said measuring device and activates said heating device when the air flow through said air passage falls below a predetermined threshold value.

22. (Rejected) The refrigeration device according to claim 21, wherein the measuring device comprises a wind wheel disposed in said air passage, wherein a turning speed of the wind wheel is indicative of said air flow through said air passage.

23. (Rejected) The refrigeration device according to claim 21, wherein the measuring device comprises a flexible lamella projecting into said air passage, wherein a deflection amount of the flexible lamella is indicative of said air flow through said air passage.

24. (Rejected) The refrigeration device according to claim 21, wherein said air passage comprises a constricted section forming a nozzle that directs outflow to a pressure chamber, and wherein the measuring device comprises a pressure sensor disposed in the pressure chamber, the control circuit estimating a flow velocity of said air flow through said air passage based on an output signal of the pressure sensor.

EVIDENCE APPENDIX

None

RELATED APPEALS APPENDIX

None